On Häckel's Theory (Allœogenesis) of the Genetic Connexion between the Geryonidæ *and* Æginidæ. By Alexander Agassiz.

In the Proceedings of the Elliot Society for 1857 M'Crady gave a very interesting account of the commensalism of the young brood of a *Cunina* and of *Turritopsis*. No notice was taken of this remarkable mode of development, M'Crady's observations having been discredited by the later publication (1865) of a magnificently illustrated memoir on the "Rüsselquallen" by Häckel. The startling hypothesis of the genetic connexion between the Geryonidæ and Æginidæ contained in this memoir, and called by Häckel allœogenesis, has been ever since a stumblingblock to all theories of genetic relationship among Medusæ.

Two short papers recently published—the one by Schulze (Mitt. naturw. Ver. f. Steiermark, 1875, p. 125), and the other by Uljanin (Ann. & Mag. Nat. Hist. March 1876, p. 215), have, however, proved conclusively that Häckel's theory, like many other of his vagaries, had no foundation of truth. It was based not merely on an incorrect interpretation of facts, but the facts themselves existed only in his imagination.

As, perhaps, with the exception of his monograph of the Radiolaria, no other memoir has contributed more than the one above quoted to give Häckel the position he holds among zoologists, we may be allowed to remind the Häckelian school of naturalists that this same genetic connexion has furnished the text for many a sermon from their high priest. Infallible himself, he has been unsparing in his condemnation of the ignorance and shallowness of his opponents. Proved now to be in the wrong, we expect therefore justice without mercy from this stern scientific critic, and look forward in the next number of the 'Jenaische Zeitschrift' for a thorough castigation of Häckel by Häckel, showing up the absurdity of allœogenesis and all that hangs thereby.—*Silliman's American Journal*, May 1876.

On the Embryogeny of the Ephemeræ, *especially that of* Palingenia virgo, *Oliv.* By M. N. Joly.

With the exception of the memoir by Luigi Calori "Sulla generazione vivipara della *Chloë diptera* (*E. hemera diptera*, Linn.)"*, there is, so far as I know, no work on the embryogeny of the *Ephemeræ*†. One might even say that all the acts concerned in the reproduction of these insects are still enveloped in a mysterious veil. Their copulation has been differently described by the authors who have treated of it. Swammerdam even denies that it ever takes place, and thinks that the ova are fecundated by the male liquid

* See 'Nuovi Annali delle Scienze Naturali,' ser. 2, tome ix. Bologna, 1848.

[† The author seems to have no knowledge of Sir John Lubbock's paper "On the Development of *Chloëon dimidiatum*," in the Transactions of the Linnean Society, vols. xxiv. and xxv.—Ed.]

after the fashion of those of fishes *. This is a manifest error, as the eggs of *Palingenia virgo*, collected by us immediately after their deposition on the piles of the quays of the Garonne, underwent development in little artificial lakes.

Réaumur asserts that he was several times witness to the copulation of *Palingenia virgo*; but the few words he says about it prove that he did not sufficiently observe it. De Geer is more explicit; but his description is so vague as to leave doubts in the reader's mind. Lastly, M. Pictet, the author of a splendid monograph of the Ephemeridæ, is completely silent with regard to the important act in question, probably because he never witnessed it. We have been no more fortunate than the learned Genevese Professor; and Calori was not more successful.

More favoured than his predecessors, Eaton has described, as an eye-witness, the aerial amours of the insects under consideration. According to him the male seizes the female with his abdominal forceps, compels her to yield to his desires, and fecundates the ova in the ordinary manner.

When examined separately, the eggs resemble small semitransparent grains of sand of a yellowish white colour and of an ovoid form, with the smaller extremity surmounted by a sort of hood, of a brown colour and spongy consistence, formed of tubes or cells arranged concentrically, in the midst of which we have thought we could perceive the micropyle. The diameter of the egg is scarcely $\frac{1}{4}$ millim. The shell is rather hard, and resists the decomposing action of the water for a long time, even after hatching. The vitellus consists, as usual, of a multitude of granules and oily drops, destined partly for the formation of the organs, and partly for the nutrition of the young individual.

It is always towards the large end of the egg that its development commences; it is there that the vitelline globules become converted at first into a finely granular blastoderm. In this region the egg becomes more transparent; and from the fifth to the sixth day of incubation we vaguely discern the part that will become the head. This detaches itself in the form of a crescent upon the dark ground of the vitellus; then a few days afterwards the abdomen appears at the opposite pole of the egg, its segmentation always much preceding that of the thorax, and always commencing at its setigerous extremity. The caudal setæ themselves appear early.

At first we see neither eyes, mouth, nor antennæ in the blastodermic mass which represents the head; but as soon as the eyes have appeared in the form of black spots composed of fine granules of that colour, or even a little earlier, we see rising from the lateral parts of the head tubercles or appendages representing the mandibles and the maxillæ. The labrum and labium appear much later.

The antennæ at first resemble thick conical rods, obscurely three-

* Swammerdam expresses himself as follows on this point:—"Tum igitur Faniella, more piscium, sua excutit ovula, *quæ deinde a mascula*, qui itidem prius ex aquis evolat, et postmodum teneram adhuc pelliculam in terra exuit, *spermate vel lactibus effusis fecundabitur*" (Biblia Naturæ, tome i. p. 235: Leyden, 1737).

or four-jointed, with the free extremity directed towards the caudal portion.

The legs make their appearance under an analogous form, and fold down against the thorax in proportion as they enlarge. Their articulations are at first very indistinct, but soon become more marked; and we then distinguish all the parts which ordinarily compose these appendages.

The abdomen, which increases more and more in length, gradually shows the nine segments with which it is furnished at the time of hatching; but it is folded in the form of a bow in front of the thorax and cephalic mass, which it finally masks in part.

The caudal setæ, as already stated, originate early upon the last abdominal segment; but like the other appendages (antennæ, mandibles, maxillæ, legs) they are at first destitute of any segmentation, and, what is more, of all villosity.

During the whole time that the animal remains in the egg we do not see any internal organ completely formed in it; the intestine itself is only indicated by a mass of oily drops and vitelline granules occupying the axis of the body, and more or less opaque except towards the caudal extremity, which is perfectly transparent. It is almost unnecessary to say that the vitellus becomes less and less abundant in proportion as the body and its appendages are developed. As in all other insects, it adheres to the dorsal region, which is always the last to be formed.

It is to be noted that for a very long time (about two months and a half) all the appendages and, especially, the cephalic mass have so little consistency as to be *diffluent*, after the fashion of sarcode, if the embryo is extracted from the egg and immersed in water. By degrees, however, the organs become consolidated, and towards the end of the sixth month, or in the first days of the seventh, the embryo bursts its envelope and exclusion takes place.

At this moment the young larva of *Palingenia virgo* is at most 1 millim. in length. It is still destitute of some apparatus which, at the first sight, would appear to be indispensable for life, and the late appearance of which may well surprise us. Thus at first it possesses no visible nervous or muscular system, no circulatory apparatus, no complete digestive tube, and no special organs of respiration. Its mouth is not so well armed and its legs less villous than in the adult larva. Its antennæ and caudal setæ possess neither the number of joints nor the villosity which they will afterwards acquire; in a word, compared with what it will be a little before its nymphosis, it may be said to be a very incomplete animal.

We have elsewhere described in detail the singular metamorphoses that the false branchiæ of *Palingenia virgo* undergo. They appear at first in the form of tubular cæca suspended from the posterior angles of the first six segments of the abdomen; then, with increasing complication, they become lamellar, at first simply denticulated behind, but afterwards furnished with tubular fringes on the margins; then they present definitively the appearance of a double lanceolate leaf, traversed by a large tracheal trunk with fine branchlets.

As soon as the false branchiæ appear (that is to say, eight or ten days after hatching), the blood-corpuscles may be seen oscillating in the dorsal vessel, then vaguely indicated. Eight days later the circulation is well established, and is effected in the manner indicated in the well-known and often-cited memoirs of Carus and Verlorey.

The buccal and locomotive organs undergo analogous changes, although less strongly marked than those of the branchiæ, always excepting the mandibles, which become more robust and more villous, and acquire a form rather different from that of the mandibular hooklets of the larva when only a few days old.

When it has attained the age of six months, and a length of from 7 to 8 millims., which corresponds to that age, the larva of *Palingenia virgo* is no longer subject to changes of any importance, until the time of nymphosis; but those which it has already undergone authorize us in saying that it presents a new and striking example of *hypermetamorphosis*, analogous to those which we have made known in the larvæ of the Œstridæ (*Œstrus equi*). Von Siebold has indicated similar phenomena in the Strepsiptera, and Fabre, of Avignon, in *Meloë*.

We have fully ascertained the precise duration of the incubation of the egg of *Palingenia virgo*. By care, patience, and perseverance, after frequent checks, I have succeeded in ascertaining that the time necessary for the hatching of the egg is six months at least, and seven months at the most. None of the naturalists who have preceded me were able, I believe, to arrive at this result. Swammerdam himself therefore would no longer have the right to repeat now-a-days what he said when he wrote his admirable memoir on the *Ephemeræ*—namely, that the period of the incubation of their eggs is very difficult to say, and known of God alone, who gave them form and life *.

Lastly, from the observations that we have made during many consecutive years (from 1862 to 1874), and the principal results of which are contained in the note which we have the honour to lay before the Academy, the illustrious author of the 'Biblia Naturæ' would be no more authorized to maintain that the larvæ of the *Ephemeræ* at their escape from the egg do not differ from the adult larvæ either in form or organization:—"A vermibus adultioribus nec figura, nec fabrica discrepant."—*Comptes Rendus*, May 1, 1876, p. 1030.

Protection of Herbaria and Entomological Collections from Insects by means of Sulphide of Carbon. By M. J. B. Schnetzler.

M. Schnetzler of Lausanne states that the collection of Swiss flowering plants belonging to the Academy of Lausanne having been attacked by *Anobium paniceum*, he was led to try the effect of sulphide of carbon in destroying those insects and their larvæ. He had a wooden box made large enough to contain five fasciculi of the herbarium, each composed of about 200 plants. Four ounces of sulphide

* "Dictu sane quam difficillimum est, nec nisi soli Deo notum, iis qui formam vitamque dedit" (Biblia Naturæ, tome i. p. 236).